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(71) Applicant: **Triollet Mullos B.V.**
NL-7581 HE Losser (NL)

(72) Inventor: **van der Plas, Nicolaas**
7576 WB Oldenzaal (NL)

(74) Representative: **Louet Feisser, Arnold et al**
Trenité Van Doorne
De Lairesestraat 133
1075 HJ Amsterdam (NL)

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(54) A device and a method for mixing fodder

(57) A movable mixing device for mixing and/or
loosening fodder, which device is provided with a mixing
chamber (8) comprising one or more rotors (6) which
are rotatable about a vertical axis, which mixing cham-
ber (8) is provided with a bottom (9) and with wall parts
(11) which slope upwards toward the outside, and
wherein means are present for filling said mixing cham-

ber (8), said means comprising a closable opening in a
side wall (11) of said mixing chamber (8), through which
the material to be mixed can be supplied to the mixing
chamber (8). Said opening is closed by a pivotable mov-
ing means being pivotable about an axis near the lower
part of the mixing chamber (8).

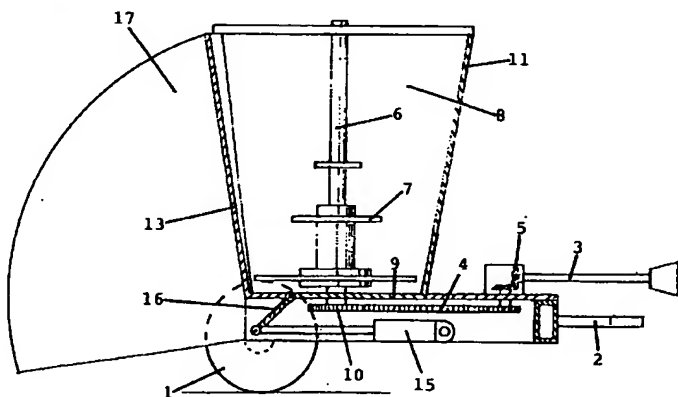


FIG. 2

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Description

The invention relates to a movable mixing device for mixing and/or loosening fodder, which device is provided with a mixing chamber comprising one or more rotors which are rotatable about a vertical axis. The term fodder in this description is to be given a wide interpretation, it comprises silage, among other things, but also all other types of fodder that need to undergo a mixing and/or loosening operation before being fit for consumption. Also the terms mixing and loosening are to be given a wide interpretation. Also cutting operations fall under that term.

Mixing devices provided with a rotor which is rotatable about a vertical axis are known in agriculture. Such devices generally have a mixing chamber provided with a side wall which slopes upwards toward the outside. Material to be mixed, for example silage, is introduced into the device from above, after which it is processed by the rotor, which is provided with mixing means. A conveyor belt may for example be used for introducing material into the mixing chamber, which conveyor belt transports the material to above the device and then drops it into the mixing chamber. After having undergone the required processing in the mixing chamber, the fodder may be discharged through an opening in the side wall of the mixing chamber to a conveyor belt, which can subsequently carry off said fodder to the desired location.

The object of the invention is to provide an improved machine for mixing and/or loosening fodder.

According to one aspect of the invention the device is provided with a mixing chamber, which may be filled through an opening in the side wall thereof. It is possible thereby to design part of the side wall of the mixing chamber such that said part of the side wall is used to introduce material into the mixing chamber when filling said mixing chamber.

Preferably the feed opening of the mixing chamber is located at the rear side of the device. The part of the side wall which closes the mixing chamber during mixing and which is open during filling will be called the moving means herein.

The moving means may also be in the form of a wall part of the mixing chamber, which can pivot about a substantially horizontal pivot axis located near the bottom of the mixing chamber. As a result of this the wall part, hereinafter also called loading board, can pivot downwards to the floor or to a position near the floor, after which the material may be deposited on the loading board. The term floor refers to the floor on which the device or the tractor to which the device is attached stands. The material is then introduced into the mixing chamber as a result of the pivoting of the loading board to the closed position. Also in this embodiment of the invention guide plates may be provided for correctly guiding the material to the mixing chamber.

The above-described loading board may also be provided with cutting means, for example for cutting off

silage, whereby said cutting means are mounted in such manner as to be capable of pivoting movement with respect to the loading board and whereby said cutting means can pivot upwards along with the loading board to the closed position.

The device according to the invention may be provided with wheels, so that the device can be hitched to a tractor as a trailer, it is also possible, however, for the device to be hitched to a tractor via the three-point linkage.

If the device is provided with wheels, said wheels are preferably not positioned under the bottom of the device but beside said bottom. Furthermore the device is preferably designed such that the wheels are positioned behind the widest part of the device. When in addition to this the driving gear of the rotor or rotors is of flat construction, the bottom may be positioned close to the floor, and the wheels can be pivoted upwards during the filling of the mixing chamber, in such a manner that the bottom of the mixing chamber will come to lie even closer to the floor.

The mixing chamber may be round or oval or have an otherwise elongated shape, when seen in plan view. Preferably the mixing chamber is configured such that the largest dimension or nearly the largest dimension is located transversely to the direction of movement. The mixing chamber may be provided with one or more rotors. If more than one rotor, for example two rotors are provided, said rotors may be fitted with mixing means arranged in overlapping relationship, seen in plan view. The mixing means of the various rotors may be positioned at different heights thereby and rotate in intersecting paths.

Preferably the rotors have the same direction of rotation. The rotors are preferably driven by means of a chain drive, which chain drive may be of flat construction, butting against the under-side of the bottom of the mixing chamber, and which is moreover capable of bridging a large reduction.

The invention furthermore relates to a method for mixing fodder, wherein the mixing chamber, which is provided with a rotor which rotates about a vertical axis, is filled with material through an opening in the side wall.

If the mixing chamber of the device is provided with a bottom, part of which can hinge so as to form a feed opening or a discharge opening, whereby the hinge is located near the bottom in substantially horizontal direction, the fixed part of the bottom is preferably extended beyond said hinge, so that the hinge remains free from the material to be mixed.

Further aspects of the invention are disclosed in the following description of the Figures and defined in the claims.

Figure 1 is a plan view of an embodiment of a mixing device;

Figure 2 is a sectional view along the line II - II in Figure 1;

Figure 3 is a rear view of the device according to

Figure 1;

Figure 4 is a plan view of the same embodiment in a different position;

Figure 5 is a sectional view along the line V - V in Figure 4;

Figure 6 is a rear view of the device according to Figure 4;

Figure 7 shows an embodiment comprising a loading board provided with a cutting means, and

Figure 8 shows the embodiment according to Figure 7 in a different position.

The figures are only very diagrammatic illustrations of embodiments, wherein like parts are numbered alike. Although the device according to the invention may be constructed in such a manner that it can be mounted in the three-point linkage of a tractor, the illustrated embodiments are provided with wheels 1 and coupling means 2, by means of which the device can be hitched to a drawing vehicle. The device is driven by means of a drive shaft 3, which can be coupled to the power take-off of the drawing vehicle. In the embodiments the rotor is driven by means of a chain drive provided with a chain 4, which is coupled to the power take-off shaft 3 by means of a right-angled transmission 5. The advantage of a chain transmission is that a high reduction can be obtained and that the driving gear can be of flat construction, so that it does not project downwards too much.

In the embodiments the device according to the invention is provided with one or two rotors 6, which are rotatable about a substantially vertical axis. Like the other parts of the device, the rotors 6 are only diagrammatically indicated, and in particular the mixing means secured to the rotors, which may have a great many different shapes, are only diagrammatically indicated as disc-shaped parts 7 in most of the Figures.

The device comprises a mixing chamber 8, in which the rotors 6 can rotate, which mixing chamber 8 has a bottom 9, through which said rotors 6 extend and under which the rotor drive comprising a chain 4 and chain wheels 3 is mounted. The mixing chamber 8 is furthermore provided with a side wall 11, which slopes upwards from the bottom 9 towards the outside. The side wall 11 may be round or oval, when seen in plan view, or have an otherwise elongated shape extending either in transverse direction or in the longitudinal direction of the device.

A first embodiment is shown in Figures 1 - 6. Figure 1 is a plan view of a device comprising two rotors 6, whereby the lowermost of the (diagrammatically illustrated) mixing means overlap (seen in plan view). The lowermost mixing means 7 are thereby larger than the mixing means 7 disposed thereabove. The rotors 6 are journaled in the bottom 9 of the device, as well as in supporting beams 12, which are secured to the upper edge of the side wall 11.

In all embodiments the mixing chamber 8 may be filled with material through a recess in the side wall 11

located at the rear side of the device. The material may consist of silage, which is cut from a stock, or of any other material or mixture of materials that are to be loosened and/or mixed.

In the embodiment according to Figure 1 the rear wall part 13 of side wall 11, together with a bottom part 14, can pivot about a substantially horizontal pivot axis located in the bottom 9 and extending in the transverse direction of the device. The wall part 13 can be swung back so far that its edge will come to lie near the floor or on the floor. The pivoting movement of the wall part 13 is effected by the control cylinder 15, which is connected to the pivoted part by means of arm 16. Furthermore means may be provided for moving the wheels 1 upwards with respect to the device, so that the device can be moved to a position closer to the floor. After the material to be mixed has been deposited on wall part 13, the control cylinder 15 can pivot the wall part 13 upwards, so that said wall part butts against the other part of side wall 11. The material to be mixed will then land in the mixing chamber 8. In order to prevent material from falling sideways off the wall part 13, guide walls 17 are provided on either side of the path of movement of the wall part 13, said guide walls in this embodiment extending obliquely outwards in rearward as well as in upward direction, whereby said guide walls have a slightly curved surface.

The diagrammatically illustrated vertical rotors may have any desired shape and the mixing means 7 may be provided with any desired type of catching means, such as blades, whilst in addition they may be slightly helical, so that the material is moved upwards during rotation. The two rotors 7 may rotate in the same direction, as shown in the embodiment, as a result of which some cutting of the material will take place by the overlapping mixing means. The rotors 7 may also rotate in opposite directions, to which end the drive chain 4 must be guided into a different path, of course, or whereby a different type of drive is used.

Figure 7 shows another embodiment, wherein the device is provided with a pivoted loading unit 52, which can be pivoted about a pivot pin 53 by means of a control cylinder 54. A cutting device 55 is pivoted to loading unit 52, which cutting device can be pivoted about pivot pin 57 by means of control cylinder 58. The cutting device 55 is provided with cutting means 59, which may or may not be movable, by means of which silage may be cut from a stock, for example. The guide plate 50 thereby ensures that the cut-off silage lands in the loading unit 52. When sufficient material has been cut off, the entire loading unit can be pivoted about pivot pin 53 to the position shown in Figure 8, whereby the cut-off material is deposited in the mixing chamber.

The construction is not limited to the illustrated embodiments, which are only given by way of illustration.

Further preferred embodiments of the movable mixing device according to the invention are as follows.

A device whereby the said feed opening is located

at the rear side of said mixing chamber, seen in the normal direction of movement of the device.

A device whereby said rotors comprise a helical mixing means and that their rotations are attuned to each other.

A device whereby said guide walls extend beyond the side wall of the mixing chamber into said mixing chamber.

A device whereby a lower guide wall slopes upwards into the mixing chamber, whereby part of the rotor can move under the guide wall.

A device whereby said guide wall is provided with a flexible closing means, against which the moving means can abut in the closed position of the feed opening.

A device whereby, in the position wherein the feed opening is closed, said moving means slightly extends at an acute angle with respect to the vertical longitudinal plane of the device.

A device whereby said guide walls include an angle with the vertical longitudinal plane, and that in such a manner that said guide walls diverge both in rearward and in upward direction.

A device whereby means are provided for lowering said mixing chamber with respect to said wheels to a position closer to the floor.

A device whereby said swing-down part also comprises a part of the bottom of the mixing chamber.

A device whereby guide walls are provided, which laterally bound said swing-down part.

A device whereby part of the bottom can pivot about a pivot axis located near the bottom and whereby the fixed part of said bottom continues above and beyond said pivot axis.

Claims

1. A movable mixing device for mixing and/or loosening fodder, which device is provided with a mixing chamber (8) comprising one or more rotors (6) which are rotatable about a vertical axis, which mixing chamber (8) is provided with a bottom (9) and with wall parts (11) which slope upwards toward the outside, and wherein filling means are present for filling said mixing chamber (8), said means comprising a closable opening in a side wall (11) of said mixing chamber (8), through which the material to be mixed can be fed to the mixing chamber (8), whereby said feed opening may be closed during the mixing operation by a moving means which introduces the material into the mixing chamber (8) while said filling takes place, said moving means is pivotable about a pivot axis located near the lower part of the mixing chamber (8).
2. A device according to claim 1, characterized in that the moving means comprise a part of the side wall which can be swung down in such a manner that its edge can be moved to a position near the ground.

3. A device according to any one of the preceding claims, characterized in that said feed opening is bounded by guide walls (17), along which the moving means can move and which guide the material to the mixing chamber (8).

4. A device according to claim 3, characterized in that a lower guide wall (17) extends outwards to a position near the floor on which the device stands.

5. A device according to any one of the preceding claims, characterized in that said filling means comprise a part (13) of the side wall (11) and a part (14) of the bottom (9) of the mixing chamber (8), which parts (13,14) are jointly pivoted about a pivot axis located in the bottom (9), which extends in transverse direction, whereby the edge of the pivoted part (13,14) located furthest from said pivot axis can butt against the floor on which the device stands.

6. A device according to claim 5, characterized in that said opening is provided with two guide walls (17) extending outwards with respect to the mixing chamber (8), along which the pivoted part (13,14) can move and which laterally bound said feed opening.

7. A device according to any one of the preceding claims, characterized in that said moving means is provided with a pivoted cutting means, which is capable of cutting material from a stock, which material is introduced into said mixing chamber by swinging up the swing-down part.

8. A method a method for mixing and/or loosening fodder, wherein said fodder is processed by one or more rotors (6) which rotate about a vertical axis, whereby the mixing chamber (8) is filled through an opening in the side wall (11) thereof, which opening is closed by moving means which can pivot about an axis near the lower part of the mixing chamber (8).

9. A method wherein one or more of the measures according to any one of the preceding claims is used.

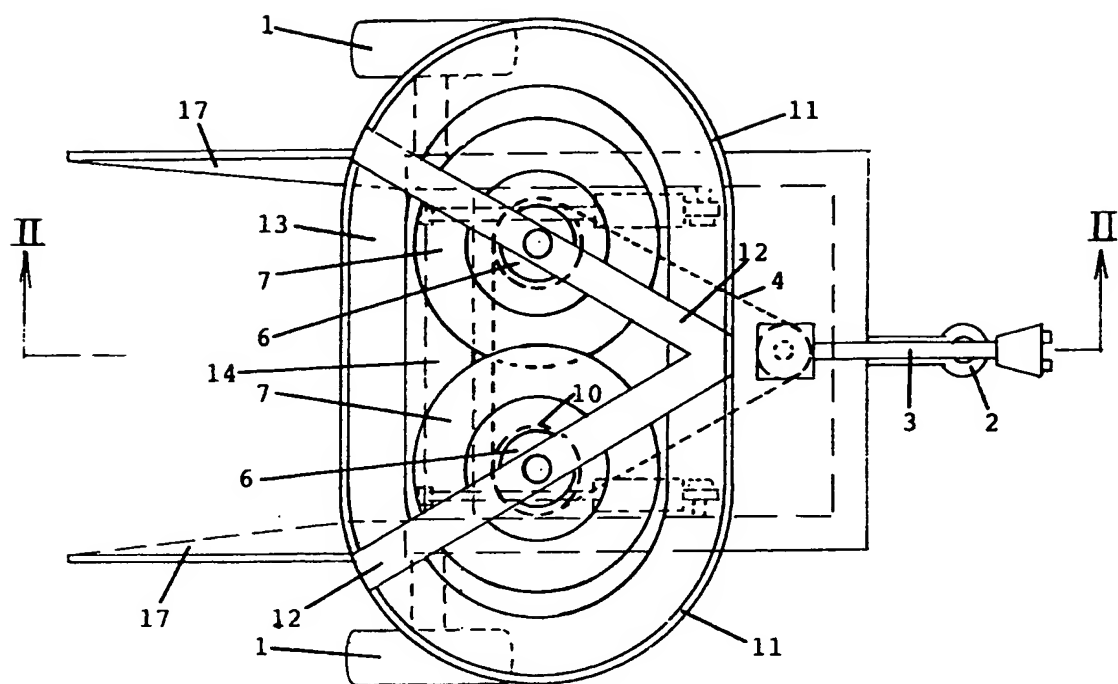


FIG. 1

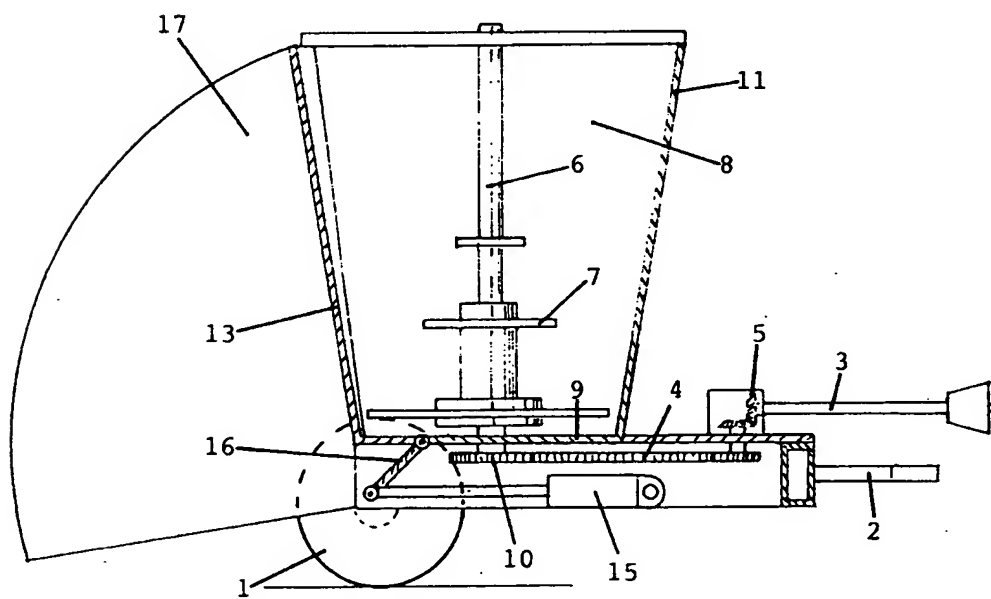


FIG. 2

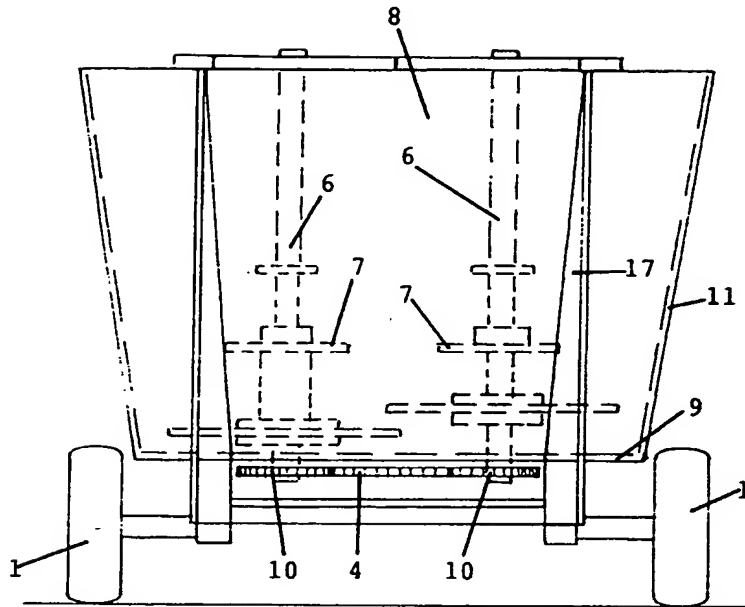


FIG. 3

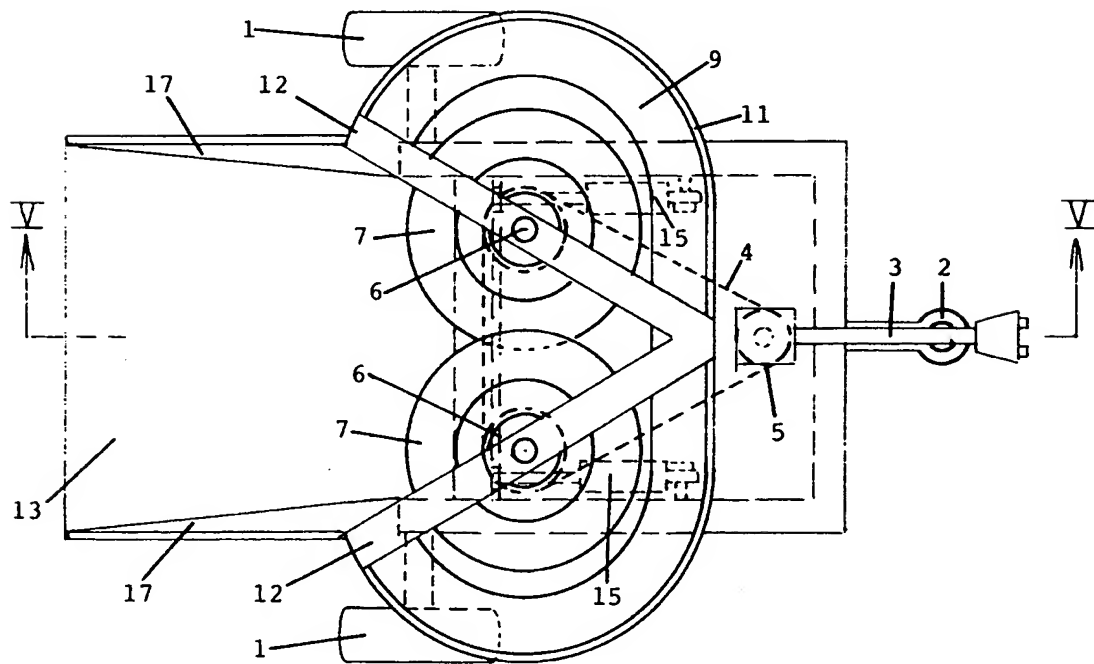


FIG. 4

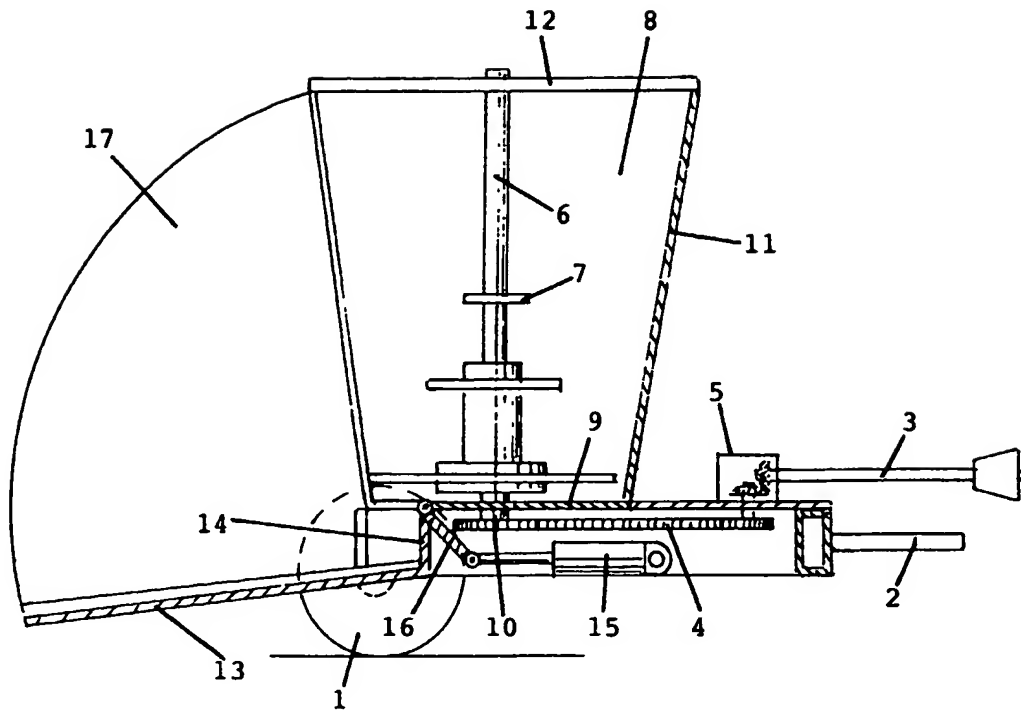


FIG. 5

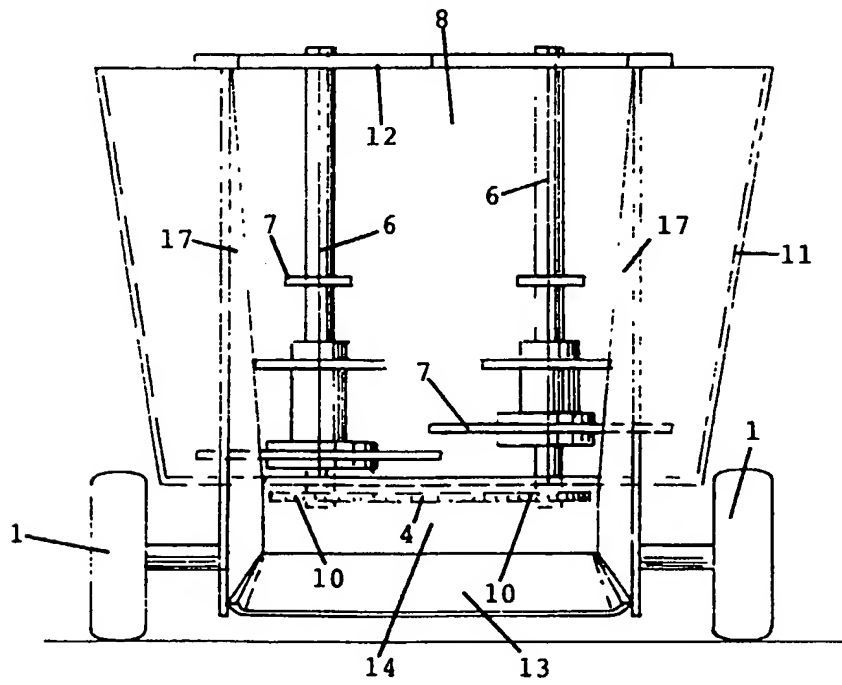


FIG 6

